

COMPUTER GRAPHICS

Subject Code: ME512OE

Regulations: R16 - JNTUH

Class: III Year B.Tech CSE I Semester



Department of Computer Science and Engineering
BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY

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COMPUTER GRAPHICS [ME512OE]

(Open Elective)

COURSE PLANNER

I. COURSE OVERVIEW:

Basic principles and techniques for computer graphics on modern graphics hardware. Students will gain experience in interactive computer graphics. Topics include : 2D viewing, 3D viewing, perspective, lighting and geometry.

II. PREREQUISITE:

1. Mathematics – Linear algebra is recommended.
2. Good programming skills in C
3. This class we will teach algorithms, not programming in C.
4. Familiarity with the theory and use of coordinate geometry and of linear algebra, such as matrix multiplication.
5. A course on “Computer Programming and Data Structures”

III. COURSE OBJECTIVE:

1	This Course provides an introduction to the principles of computer graphics. In particular, the course will consider methods for modeling 2-D objects and how it generates photorealistic renderings on color raster graphics devices. The emphasis of the course will be placed on understanding how the various elements that like algebra, geometry, algorithms and data structures interact in the design of graphics
2	This course provides an idea on hardware system architecture for computer graphics. This includes, but it is not limited to: graphics pipeline, frame buffers, and graphic co – processors.
3	To give idea about basic building blocks of multimedia and a study about how these blocks together with the current technology and tools

IV. COURSE OUTCOME:

S.No	Description	Bloom’s Taxonomy Level
1	Students will be able to describe the fundamental algorithms used in computer graphics and to some extent be able to compare and evaluate them	Knowledge, Understand (Level1, Level2)
2	Students will be able to work and interact, through hands-on experiences, to design, develop, and modify electronically generated imagery using a wide range of sophisticated graphical tools and techniques.	Apply, Create (Level 3)
3	Students will be able to summarize different hidden surface elimination algorithms and shading techniques used in computer graphics and digital media production.	Evaluate (Level 3)
4	Students will be able to explain about the technology necessary for creating multimedia content for the web, video,	Analyze

	DVD, 2D and 3D graphics, Sound and programming.	(Level 3)
5	Students can apply the knowledge, techniques, skills and modern tools to become successful professionals in communication and media industries	Apply (Level 3)

V. HOW PROGRAM OUTCOMES ARE ASSESSED:

	Program Outcomes (PO)	Level 1	Proficiency assessed by
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems related to Computer Science and Engineering.	3	Assignments
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems related to Computer Science and Engineering and reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	3	Assignments
PO3	Design/development of solutions: Design solutions for complex engineering problems related to Computer Science and Engineering and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	2	Assignments
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	2	Assignments
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	--	--
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Computer Science and Engineering professional engineering practice.	1	Assignments
PO7	Environment and sustainability: Understand the impact of the Computer Science and Engineering professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	-	--
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	-	--

PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	-	--
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	-	--
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	-	--
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	2 -	Research

VI. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED

Program Specific Outcomes (PSO)		Level	Proficiency assessed by
PSO1	Foundation of mathematical concepts: To use mathematical methodologies to crack problem using suitable mathematical analysis, data structure and suitable algorithm.	3	Lectures, Assignments
PSO2	Foundation of Computer System: The ability to interpret the fundamental concepts and methodology of computer systems. Students can understand the functionality of hardware and software aspects of computer systems.	2	Lectures, Assignments
PSO3	Foundations of Software development: The ability to grasp the software development lifecycle and methodologies of software systems. Possess competent skills and knowledge of software design process. Familiarity and practical proficiency with a broad area of programming concepts and provide new ideas and innovations towards research.	--	--

VII. SYLLABUS:

UNIT - I Introduction:

Application areas of Computer Graphics, overview of graphics systems, Video -display devices, Raster - scan systems, random scan systems, graphics monitors and work stations and input devices Output primitives: Points and lines, line drawing algorithms, mid - point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary - fill and flood - fill algorithms.

UNIT – II 2 - D Geometrical transforms:

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms transformations between coordinate systems.

2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to view - port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT –III 3-D Object representation:

Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces, sweep representations, octrees BSP Trees, 3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT – IV Visible surface detection methods:

Classification, back - face detection, depth - buffer, scan - line, depth sorting, BSP - tree methods, area sub- division and octree methods Illumination Models and Surface rendering Methods: Basic illumination models, polygon rendering methods

UNIT - V Computer animation:

Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

TEXT BOOKS:

- 1.“Computer Graphics C version”, Donald Hearn and M. Pauline Baker, Pearson education.
- 2.“Computer Graphics Second edition”, Zhigand xiang, Roy Plastock, Schaum’s outlines, Tata Mc Graw hill edition.

REFERENCE BOOKS:

- 1.“Computer Graphics Principles & practice”, second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
- 2.“Procedural elements for Computer Graphics”, David F Rogers, Tata Mc Graw hill, 2nd edition.
- 3.“Principles of Interactive Computer Graphics”, Neuman and Sproul, TMH.
4. “Principles of Computer Graphics”, Shalini, Govil-Pai, Springer.
5. “Computer Graphics”, Steven Harrington, TMH
6. Computer Graphics, F. S. Hill, S. M. Kelley, PHI.
7. Computer Graphics, P. Shirley, Steve Marschner & Others, Cengage Learning.
8. Computer Graphics & Animation, M. C. Trivedi, Jaico Publishing House.
9. An Integrated Introduction to Computer Graphics and Geometric Modelling, R.Goldman, CRC Press, Taylor&Francis Group.
- 10.Computer Graphics, Rajesh K.Maurya, Wiley India.
11. Computer Graphics, Atul P. Godse, Technical Publications

NPTEL Web Course:

1. <http://nptel.ac.in/courses/106106090/>

NPTEL Video Course:

<http://nptel.ac.in/courses/106106090/#>

UGC-NET Syllabus

Display system , input devise, 2D, geometry, Graphics operation, 3D Graphics, Animation Graphic Standard, Application concepts, Storage Devices, Input Tools, Authoring Tools, Application files

VIII. COURSE PLAN (WEEK-WISE):

Session	Week	Unit	Topics	Course Learning outcomes	References
1	1		Introduction: Application area of Computer Graphics	Define Computer Graphics	T1, R1
2			Overview of graphics systems	Know about CG	T1, R1
3			Video - Display Devices	Gathering Knowledge about Video - Display Units	T1, R1
4			Raster - Scan Systems	Gathering Knowledge about Raster Scan Systems	T1, R1
5			Random Scan Systems, Graphics Monitors	Gathering Knowledge about Random Scan Systems in CG	T1, R1
6	2	1	work stations ,Input devices	Know about the Workstaions and Input Devices	T1, R1
7			Output Primitives: Points and Lines, Line Drawing Algorithms	Understanding the line drawing algorithms, Mid-Point Circle and Eclipse Algorithms	T1, R1
8			mid-point circle and eclipse algorithms		T1, R1
9			Filled Area Primitives: Scan Line Polygon fill algorithm	Compose the Knowledge about the Filled Area Primitives in CG	T1, R1
1			boundary – fill and flood - fill algorithms		T1, R1
1	3	2	2-D Geometrical Transformations: Translation, Scaling	Synthesis the 2D Geometrical Transformation Using CG Techniques	T1, R10
1			rotation, reflection and shear transformations		T1, R10
1			matrix representations and homogeneous coordinates		T1, R10
1			composite transforms, transformations between coordinate systems		T1, R10
1			2-D Viewing: The viewing pipeline, viewing coordinate reference frame		Compose the 2-D Viewing ability by means of Pipeline and Coordinate Points
1		Window to view-port coordinate transformation	T1, R10		
1		Viewing functions	T1, R10		

1		Line Clipping Algorithm: Cohen - Sutherland	Compose the Knowledge about the Following Algorithms: (1) Line Clipping (2) Polygon Clipping	T1, R10
1		Line Clipping Algorithm: Cyrus - Beck		T1, R10
2		Polygon Clipping Algorithm : Sutherland - Hodgeman		T1, R10
2		MOCK TEST - I		T1, R10

Session	Week	Unit	Topics	Course Learning outcomes	References
2	5	3	3-D Object Representation: Polygon Surfaces, Quadric surfaces,	Understanding the 3D Object Representation	T1,T2,R1
2			Spline representation, Hermitive Curve	Understanding the 3D Object Representation with Spline and Hermitive Curve	T1,T2,R3
2			Bezier Curve	Compose the Knowledge of the Followings: (a) Beizer Curve (b) B-Spline Curve (c) Beizer and B-Spline Surface (d) Sweep Representation (e) Octrees BSP Trees	T1,T2,R3
2			B-Spline Curves		T1,T2,R3
2			Bezier and B-Spline surfaces		T1,T2,R3
2	3	Sweep representations, Octrees BSP Trees	T1,T2,R3		
2			MID EXAMINATION - I		T1,T2,R3
2	6	3	3-D Geometric transformations: Translations, Rotation	Synthesis the 3-D Geometric Transformation, Scaling, Reflection and Shear Transformation, Composite Transformations	T1,T2,R3
2			Scaling, reflection and Shear transformations		T1,T2,R3
3			composite transformations		T1,T2,R3
3			3-D Viewing: Viewing pipeline, viewing coordinates	Compose the 3-D Viewing ability by means of Pipeline and Coordinate Points	T1, R10
3	3	View volume and general projection transforms and clipping	T1, R10		
3	7	4	Visible Surface Detection methods: Classification	Gathering the Knowledge about Visible Surface Detection Methods	T1, R10
3			Back - Face detection		Analyse the Back-Face Detection

3		depth-buffer, scan - line	Analyse the Depth-Buffer Algorithm	T1, R10	
3		depth sorting	Analyse the Scan-Line and Depth-Sorting Algorithm	T1, R10	
3	8	depth sorting	Analyse the Depth Sorting	T1, R10	
3		BSP - tree methods	Synthesis the BSP-Tree Methods, Area Sub-Division and Octree Methods	T1, R10	
3		area sub -division and octree methods		T1, R10	
4		Illumination Models and Surface rendering Methods: Basic Illumination models	Gathering Knowledge about the Illumination models for Surface rendering	T1, R10	
4		polygon rendering methods		T1, R10	
4		MOCK TEST - II			T1, R10

Session	Week	Unit	Topics	Course Learning outcomes	References
41	9	5	Computer Animation: Design of animation sequence	Gathering Knowledge about the Computer Animation sequences	T1,T2, R10
42			Computer Animation: Design of animation sequence		T1,T2, R11
43			general computer animation functions	Compose the Knowledge about General Computer animation Functions	T1,T2, R11
44			general computer animation functions		T1,T2, R11
45			raster animation	Synthesis Raster animation mechanism	T1,T2, R11
46		raster animation	T1,T2, R11		
47		1	computer animation languages	Gathering Knowledge about Computer Animation Languages, Key Frame usages and Motion Specifications	T1,T2, R11
48			key frame systems		T1,T2, R11
49			motion specifications		T1,T2, R11
50	MID EXAMINATION - II				T1,T2, R11

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF

	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	1	2	-
CO3	2	-	1	-	3	-	-	-	-	-	-	-	2	-	-

CO4	2	2	-	2	-	1	-	-	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-
AVG	1.4	1.2	0.6	0.4	0.6	0.2	-	-	-	-	-	-	1	0.4	-

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

X. QUESTION BANK (JNTUH)

UNIT I

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Explain Raster and Random Scan Displays	Understand	2
2	Explain Briefly About flat panel displays	Knowledge	2
3	Explain Raster and Random Scan Systems	Understand	1
4	Discuss about Graphics Monitors and Workstations	Understand	2
5	List and Explain the Input Devices	Understand	1
6	Describe in CRT in details	Knowledge	2
7	Explain briefly about CRT Monitors	Understand	2
8	Discuss about three dimensional viewing devices	Analyze	2
9	Explain how CAD is used in computer graphics	Knowledge	5
10	Explain the following two applications of computer graphics (a) Presentation Graphics(b) Image Processing	Understand	5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Define Computer Graphics	Knowledge	1
2	List the Application of Computer Graphics	Understand	2
3	Define Refreshing of Screen	Knowledge	1
4	Define Pixel	Knowledge	1
5	Define refresh Buffer	Knowledge	1
6	List out the merits and demerits of DVST	Understand	2
7	Discuss about LCD	Analysis	2
8	Differentiate Emissive and Non – Emissive Displays	Analysis	2
9	List out the merits and demerits of Plasma Panel Display	Understand	2
10	Define Persistence	Knowledge	1

UNIT II

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
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1	Discuss about the general point pivot point and scaling	Understand	4
2	Discuss about composite transformations for translation, scaling, rotation	Apply	4
3	Solve the multiplication process of transformation for each of the following sequence of operations is commutative (a) Two successive rotations	Analyze	4
4	Discuss 3D - Rotation	Knowledge	5
5	Discuss 3D - Scaling	Knowledge	5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Define Transformation	Understanding	4
2	Define Translation	Understanding	4
3	Define Scaling	Understanding	4
4	Define Rotation	Understanding	4
5	Define Reflection	Understanding	4

UNIT III

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Solve the following: For a Bezier surface patch given by control points[P] find the point on the surface at $u = v = 0.5$ [p] = (-3,0,3) (-3,1,1) (-3,1,-1) (-3,0,-3) (-1,1,3) (-1,1,1) (-1,1,-1) (-1,1,-3) (1,1,3) (1,1,1) (1,1,-1) (1,1,-3) (3,0,3) (3,1,1) (3,1,-1) (3,0,-3)	Apply	5
2	Analyze the procedure to calculate the parameters A,B,C,D using Cramers rule If the equation for plane surface is expressed in the form $Ax+By+Cz+D=0$	Apply	5
3	List and describe polygon table representation for two adjacent polygon surface formed with six edges and five vertices	Knowledge	5
4	Discuss about Bezier and B-Spline surfaces	Knowledge	5
5	Discuss about Hermite Curve generation	Understand	5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Define Quadric surfaces	Understand	5
2	Define Spline	Understand	5
3	Discuss about polygon table	Analysis	5

4	Discuss about Phong Shading	Analysis	5
5	Discuss about Ellipsoid Surfaces	Analysis	5

UNIT IV

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Explain A – Buffer method	Apply	5
2	Explain depth sorting method	Knowledge	5
3	Explain the BSP tree method for visible surface detection	Knowledge	5
4	Explain Back face detection method	Knowledge	5
5	Solve the equation of a plane through the points (2,4,3), (4,4,5) and (8,9,3)	Knowledge	5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Define visible surface detection methods	Understand	5
2	Define image space method	Understand	5
3	Define object space method	Understand	5
4	Differentiate image space method and object space method	Knowledge	5
5	Discuss about the followings: (a) depth field in A – buffer do (b) intensity field in A – buffer do	Knowledge Analysis	5

UNIT V

Long Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Discuss the Advantages of real time animation over frame-by-frame animation	Understand	5
2	Discuss the drawbacks of real time animation techniques	Knowledge	5
3	Describe the various ways in which the motions of objects can be specified in an animation system	Understand	5
4	Discuss about raster animations	Understand	5
5	Write short notes on computer animation languages	Knowledge	5

Short Answer Questions-

S.No	Question	Blooms Taxonomy Level	Course Outcome
1	Define Computer Animation	Understand	2
2	Discuss about the steps in animation sequence	Understand	3
3	Define frame-by-frame animation works	Understand	4

4	Define Morphing	Understand	2
5	Discuss about the methods of motion specifications	Analysis	5

OBJECTIVE QUESTIONS:

UNIT I

1. Which devices provides positional information to the graphics system ?

- a) Input devices
- b) Output devices
- c) Pointing devices
- d) Both a and c

Answer : d

2. The number of pixels stored in the frame buffer of a graphics system is known as

- a) Resolution
- b) Depth
- c) Resolution
- d) Only a

Answer : d

3. The maximum number of points that can be displayed without overlap on a CRT is referred as

- a) Picture
- b) Resolution
- c) Persistence
- d) Neither b nor c

Answer : b

4. _____ stores the picture information as a charge distribution behind the phosphor-coated screen.

- a) Cathode ray tube
- b) Direct-view storage tube
- c) Flat panel displays
- d) 3D viewing device

Answer : b

5. The process of digitizing a given picture definition into a set of pixel-intensity for storage in the frame bu called

- a) Rasterization
- b) Encoding
- c) Scan conversion
- d) True color system

Answer : c

6. In LCD, the refresh rate of the screen is

- a) 60 frames/sec
- b) 80 frames/sec
- c) 30 frames/sec
- d) 100 frames/sec

Answer : a

7.Aspect ratio means

- a) Number of pixels
- b) Ratio of vertical points to horizontal points

- c) Ratio of horizontal points to vertical points
- d) Both b and c

Answer : d

8. The primary output device in a graphics system is_____

- a) Scanner
- b) Video monitor
- c) Neither a nor b
- d) Printer

Answer : b

9. Random-scan system mainly designed for

- a) Realistic shaded screen
- b) Fog effect
- c) Line-drawing applications
- d) Only b

Answer : c

10. _____ allows screen positions to be selected with the touch of a finger.

- a) Touch panels
- b) Image scanner
- c) Light pen
- d) Mouse

Answer : a

11. The device which is designed to minimize the background sound is

- a) Microphone
- b) Digitizers
- c) Data glove
- d) Joy stick

Answer : a

12. The quality of a picture obtained from a device depends on

- a) Dot size
- b) Number of dots per inch
- c) Number of lines per inch
- d) All of the mentioned

Answer : d

13. Which of the following device is not the input device?

- a) Trackball and space ball
- b) Data glove
- c) Only d
- d) Impact printers

Answer : c

14. Which device contains thumbwheel, trackball and a standard mouse ball?

- a) Z mouse
- b) Joystick
- c) Mouse
- d) Trackball

Answer : a

15. Virtual reality, CAD, and animations are the application of

- a) Z mouse
- b) Digitizers
- c) Data tablets
- d) Image scanners

Answer : a

UNIT II

1. The matrix representation for translation in homogeneous coordinates is

- a) $P'=T+P$
- b) $P'=S*P$
- c) $P'=R*P$
- d) $P'=T*P$

Answer : d

2. What is the use of homogeneous coordinates and matrix representation?

- a) To treat all 3 transformations in a consistent way
- b) To scale
- c) To rotate
- d) To shear the object

Answer : a

3. If point are expressed in homogeneous coordinates then the pair of (x, y) is represented as

- a) (x', y', z')
- b) (x, y, z)
- c) (x', y', w)
- d) (x', y', w)

Answer : d

4. For 2D transformation the value of third coordinate i.e. $w=?$

- a) 1
- b) 0
- c) -1
- d) Any value

Answer : a

5. We can combine the multiplicative and translational terms for 2D into a single matrix representation by ex

- a) 2 by 2 matrix into 4*4 matrix
- b) 2 by 2 matrix into 3*3
- c) 3 by 3 matrix into 2 by 2
- d) Only c

Answer : b

6. We translate a two-dimensional point by adding

- a) Translation distances
- b) Translation difference
- c) X and Y
- d) Only a

Answer : d

7. The basic geometric transformations are

- a) Translation
- b) Rotation
- c) Scaling

d) All of the mentioned

Answer : d

8. The original coordinates of the point in polar coordinates are

a) $X'=r \cos (\Phi +\Theta)$ and $Y'=r \cos (\Phi +\Theta)$

b) $X'=r \cos (\Phi +\Theta)$ and $Y'=r \sin (\Phi +\Theta)$

c) $X'=r \cos (\Phi -\Theta)$ and $Y'=r \cos (\Phi -\Theta)$

d) $X'=r \cos (\Phi +\Theta)$ and $Y'=r \sin (\Phi -\Theta)$

Answer : b

9.If the scaling factors values s_x and $s_y < 1$ then

a) It reduces the size of object

b) It increases the size of object

c) It stunts the shape of an object

d) None

Answer : a

10.If the value of $s_x=1$ and $s_y=1$ then

a) Reduce the size of object

b) Distort the picture

c) Produce an enlargement

d) No change in the size of an object

Answer : d

UNIT III

1 Three dimensional computer graphics become effective In the late

a. 1960

b. 1980

c. 1970

d. 1950

Answer: b

2 A three dimensional object can also be represented using_____.

a. Method

b. Equation

c. Point

d. None of these

Answer: b

3 An_____ can be considered as an extension of spherical surface.

a. Bezier

b. Ellipsoid

c. Shearing

d. None of these

Answer: b

4 _____curve is one of the sp line approximation methods.

a. Bezier

b. Ellipsoid

c. Shearing

d. None of these

Answer: a

5 A Bezier curve is a polynomial of degree _____the no of control points used.

- a. One more than
- b. One less than
- c. Two less than
- d. None of these

Answer: b

6 The sweep representation of an object refers to the

- a. 2D representation
- b. 3D representation
- c. Both a & b
- d. None of these

Answer: b

7 The types of projection are

- a. Parallel projection and perspective projection
- b. Perpendicular and perspective projection
- c. Parallel projection and Perpendicular projection
- d. None of these

Answer: a

8 _____are the three dimensional analogs of quad trees.

- a. Quadric
- b. Octrees
- c. Geometry
- d. None of these

Answer: b

9 _____refer to the shapes created by union, intersection and difference of given shapes.

- a. Wire frame model
- b. Composite transformation
- c. Constructive solid geometry methods
- d. None of these

Answer: c

In which projection ,the plane normal to the projection has equal angles with these three

10 axes

- a. Wire frame projection
- b. Constructive solid geometry projection
- c. Isometric projection
- d. Perspective projection

Answer: c

UNIT IV

1 The basic graphical interactions are

- a. Pointing
- b. Positioning
- c. Both a & b
- d. None of the above

Answer : c

2 _____is a flexible strip that is used to produce smooth curve using a set of point.

- a. Sp line
- b. Scan-line method

- c. Depth-sorting method
- d. None of these

Answer : a

- 3 Cubic sp line are
- a. Simple to compute
 - b. Provides continuity of curves
 - c. Both a & b
 - d. None of these

Answer : c

- 4 The parametric form of 3D sp line are
- a. $X=f(t), y=g(t), z=h(t)$
 - b. $X=a_0, y=b_0, z=c_0$
 - c. $F(t)=0, g(t)=0, h(t)=0$
 - d. None of these

Answer : a

- 5 The problem of hidden surface are
- a. Removal of hidden surface
 - b. Identification of hidden surface
 - c. Both a & b
 - d. None of these

Answer : c

- 6 The algorithm of hidden surface are
- a. Object-space method
 - b. Image-space method
 - c. Both a & b
 - d. None of these

Answer : c

- 7 The method which is based on the principle of comparing objects and parts of objects to each other to find which are visible and which are hidden are called
- a. Object-space method
 - b. Image-space method
 - c. Surface-space method
 - d. Both a & b

Answer : a

- 8 Which surface algorithm is based on perspective depth ?
- a. Depth comparison
 - b. Z-buffer or depth-buffer algorithm
 - c. subdivision method
 - d. back-face removal

Answer : b

- 9 A process with the help of which images or picture can be produced in a more realistic way is called
- a. Fractals
 - b. Quad-tree
 - c. Rendering
 - d. None of these

Answer : c

- 10 Ray-tracing is an extension of
- Ray calling
 - Ray casting
 - Ray sampling
 - Ray coherence

Answer : b

UNIT – V

- 1 Jason is defining the target audience for an animation project. This is a component of which phase in the process of producing animation?
- Pre-production
 - Animated GIF
 - Post-Production
 - Production

Answer : a

- 2 Short films that use stop motion techniques are what type of animation?
- Frame-based animation
 - HTML
 - Animation
 - Production

Answer : a

- 3 What is another term to describe vector animation?
- Vector
 - Path animation
 - Alpha
 - Animation

Answer : b

- 4 Which type of animation is best suited for creating a flipbook animation?
- Frames Per Second
 - SWF
 - Frame-based animation
 - Animation

Answer : c

- 5 The types of computer animation are
- 2D computer animation
 - 3D computer animation
 - Both a & b
 - None of these

Answer : c

- 6 Special System designed for some training application are known as ?
- Video Display Devices
 - Simulators
 - GUI
 - None of above

Answer : b

- 7 The CAD stands for?

- a. Computer And Data
- b. Commonly Available Data
- c. Computer Aided Drawing
- d. Computer Aided Design

Answer : d

8 Graphics programmes create images on the screen or printer either as?

- a. Vector images
- b. Bitmapped images
- c. Both (a) and (b)
- d. None of these

Answer : a

9 Graphics software packages are available for?

- a. Pictures
- b. Charts
- c. Graphics
- d. All of the above

Answer : d

..... is the number of points per centimeter that can be plotted horizontally and vertically

- a. Aspect Ratio
- b. Pixel Depth
- c. Resolution
- d. Dot Pitch

Answer : c

XI. GATE QUESTIONS / UGC - NET:

1. If the Fourier transform of the function $f(x, y)$ is $F(m, n)$, then the Fourier transform of the function $f(2x, 2y)$ is :

- a. $1/4 F(m/2, n/2)$
- b. $1/4 F(2m, 2n)$
- c. $1/4 F(m, n)$
- d. $1/4 F(m/4, n/4)$

Answer : a

2. Which of the following statement(s) is (are) true?

- I. Two successive translations are additive.
- II. Two successive rotations are additive.
- III. Two successive scaling operations are multiplicative

- a. I & II
- b. only II
- c. II & III
- d. All the above

Answer : d

3. Given below are three basic rules:

- I. Squash and Stretch
- II. Slow-in and Slow-out

III. To stage the action properly

These rules are applied in case of :

- a. Rendering
- b. Morphing
- c. Animation
- d. All of the above

Answer : c

4. Which of the following categories of languages do not refer to animation languages?

- a. Graphical languages
- b. General-purpose languages
- c. Linear-list notations
- d. None of the above

Answer : d

5. Match the following:

- | List- I | List- II |
|----------------------------|--------------------------|
| a. Tablet, Joystick | i Continuous devices |
| b. Light Pen, Touch Screen | ii. Direct devices |
| c. Locator, Keyboard | iii. Logical devices |
| d. Data Globe, Sonic Pen | iv. 3D interaction wires |
-
- | | | | | |
|----|----|-----|-----|-----|
| a. | ii | i | iv | iii |
| b. | i | iv | iii | ii |
| c. | i | ii | iii | iv |
| d. | iv | iii | ii | i |

Answer : d

XII. WEBSITES:

<https://www.edx.org/course/computer-graphics-uc-san-diegox-cse167x-3>

<https://www.edx.org/course/foundations-computer-graphics-uc-berkeleyx-cs-184-1x>

<https://www.coursera.org/learn/interactive-computer-graphics>

XIV. EXPERT DETAILS: NA

XV. JOURNALS:

INTERNATIONAL

1. ICTACT Journal On Image & Video Processing
2. International Journals Of Computer Graphics & techniques

NATIONAL

1. Inventi Impact : Image & Video Processing

XVI. LIST OF TOPICS FOR STUDENT SEMINARS:

Alpha compositing, Anisotropic filtering, Anti-aliasing, Axis-aligned bounding box.

XVII. CASE STUDIES / SMALL PROJECTS:

1. Using Python how to Plot a bar chart, histogram, pie chart
2. Using Python how to do the data analyzing from excel sheet
3. Code Design
4. Computer Graphics in Automotive Design